A MODULAR APPROACH TO ELECTRONIC FUZE DEVELOPMENT

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FUCHS ELECTRONICS

PRESENTATION CONTENTS

- Company Background
- International Fuzing Trends
- Customized Fuze Features
- Risk Areas in Artillery Fuze Development
- Development Approach
- Fuze Components
  - Customized Features
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- Conclusion

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FUCHS ELECTRONICS - BACKGROUND

- Privately owned South African Company
- Designs and Manufactures Electronic Fuzes for Tube-Launched Ammunition
  - Artillery Fuzes
  - Rocket fuzes
  - Naval Fuzes
  - Mortar Fuzes
  - Fuze Setting Systems
- Staff of Approx. 280
- Supplies Internationally to Ammunition Suppliers and end-users
- Almost 100% of Production is Exported

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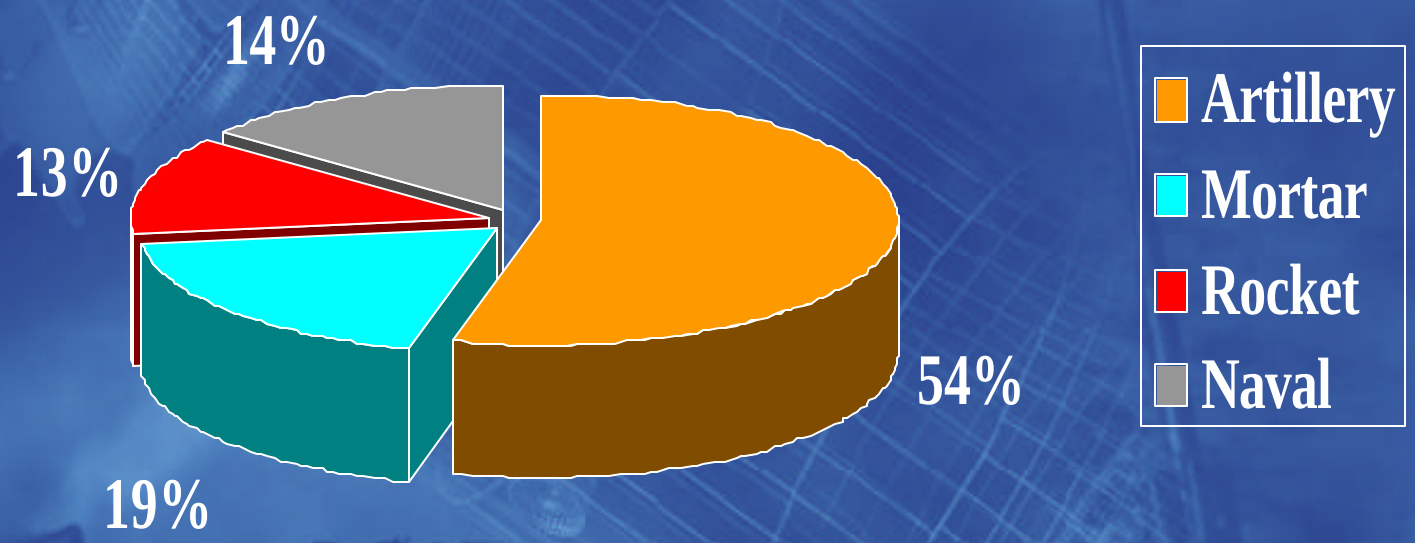
FUZE PRODUCTION PERCENTAGES
BY PRODUCT TYPE *



*** Based on sales of past 20 Years**

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International Artillery Fuzing Trends

- Customer Requirements:
  - Short Timescales – Typically 4 to 6 months to Production
  - Reduced Production Volumes
  - Customized Features
  - Proven Safety, Reliability and Qualification Status
  - Very High Probability of Project Success

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Customized Fuze Features

- Safety Times
- Burst Heights
- PD Backup feature and its Arming time
- Multi Role Usage e.g. Proximity, Time, PD, PD Delay
  - With or Without Delay Function
  - Post Impact Delay Time
- Function Switch
- Inductive Settable Features
- On-Board Displays of e.g. Time Set

- Delivery Timescales are always shorter than needed for a full development cycle !

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Risk Areas in Artillery Fuze Development

- Component breakage due to launch stresses at Highest Charges
- Survival of in-flight temperatures and pressures
- Trajectory Bursts due to:
  - Noise effects
  - Vibration
  - Ammunition instability
- Compatibility with Rocket Assisted or Base bleed Ammunition
- High Cost of Dynamic Proofing
- Lead times of Electronic components

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Development Approach

- To satisfy the requirements, the following approach has been adopted successfully:
  - Use Integrated Development Teams within the company:
    - Electronics Engineers
    - Mechanical Engineers
    - Pre-Production Representatives
    - Instrumentation Development Enginers
    - Quality Control Engineers

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Development Approach - II

- Use of proven “Building Blocks”
- In-house Prototype Manufacturing Department
- Regular Dynamic Proofing
  - Use of In-Flight Telemetry
  - Easy access to well instrumented Proof Ranges
- Development of Dedicated Test Instrumentation

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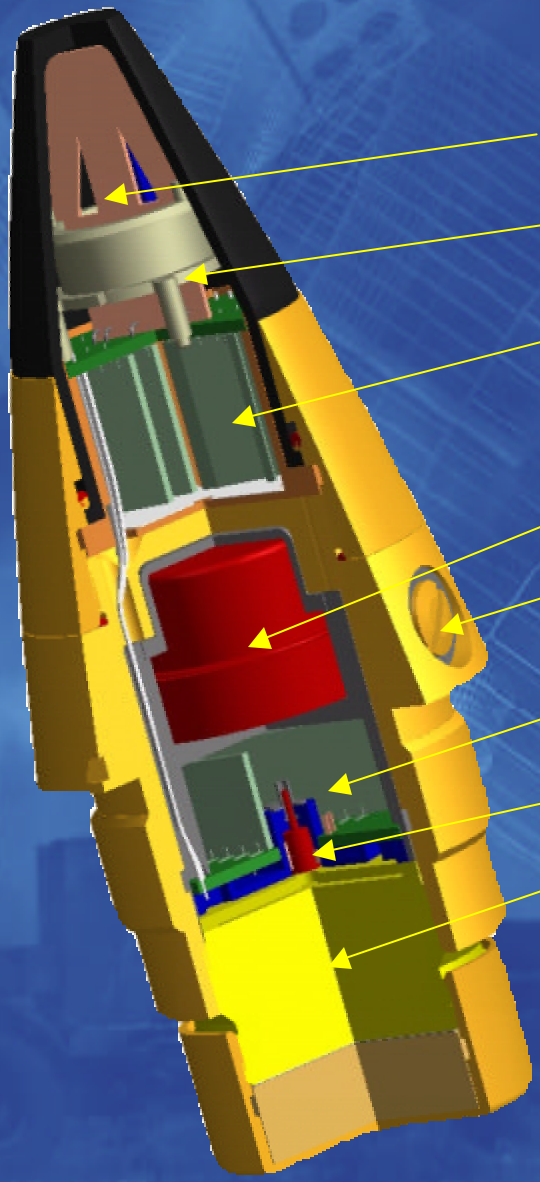
Typical electronic fuze components



Rf antenna

Inductive setting coil

Processing electronics

Reserve battery

Switch

Firing circuitry

Detonator

Safe and arm device/ booster

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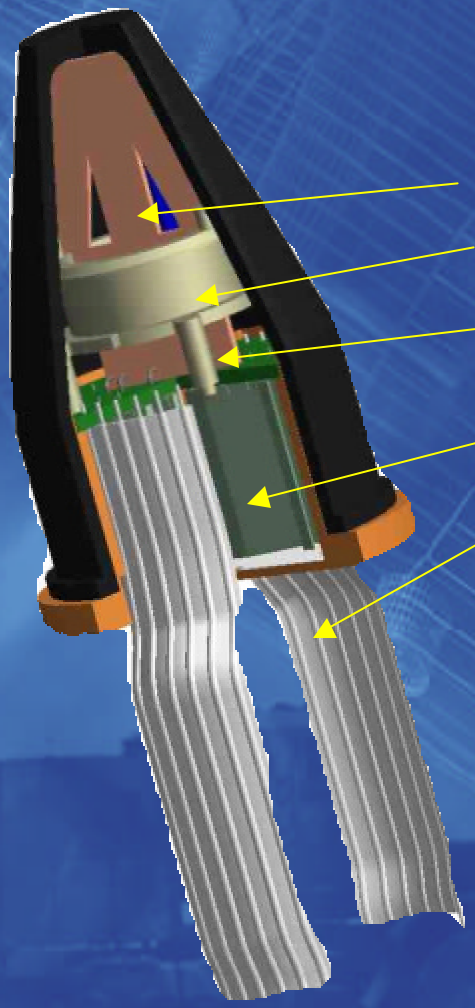
Electronic head assembly



Rf antenna for Prox / Telemetry

Inductive setting coil

Impact sensor

Processing electronics

Interconnection harness

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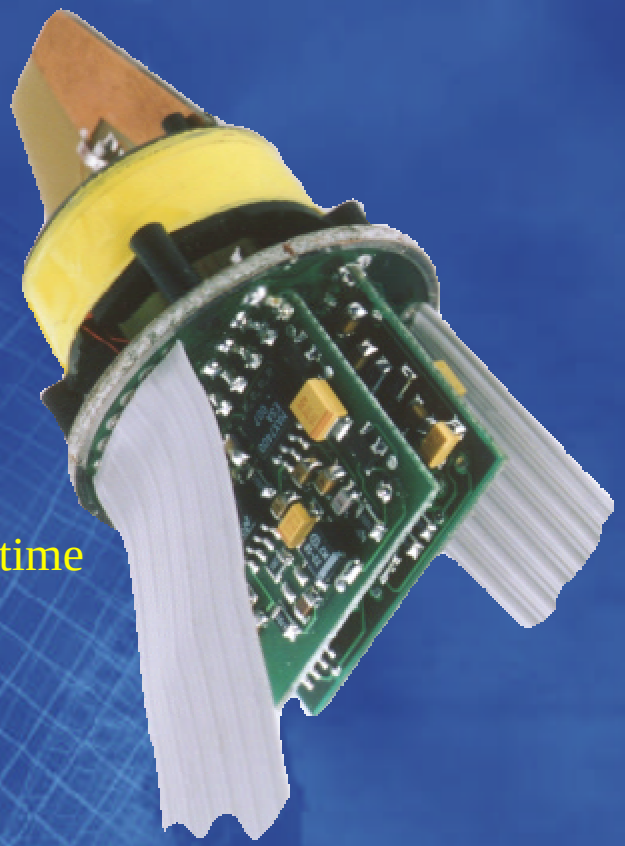
Electronic Head Assembly

- STANDARD FEATURES:
  - Microprocessor Controlled
    - Software programmed during final assembly
  - Inductively Settable or Factory Set Only
  - DATA stored in EEProm
    - Re-Writeable via Inductive coil interface
    - Mission Settings, e.g. Proximity with 6.5 sec Safety time



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Electronic Head Assembly

- CUSTOM FEATURES
  - Proximity / Time / PD Functions
    - Safety Time for PD Backup
    - Proximity Enable / Safety Time
    - Proximity Algorithm
    - Burst Heights
  - Switch Setting
  - Production / Engineering Settings
    - RF Transmission Characteristics
    - Signal Processor Characteristics
    - Telemetry Features

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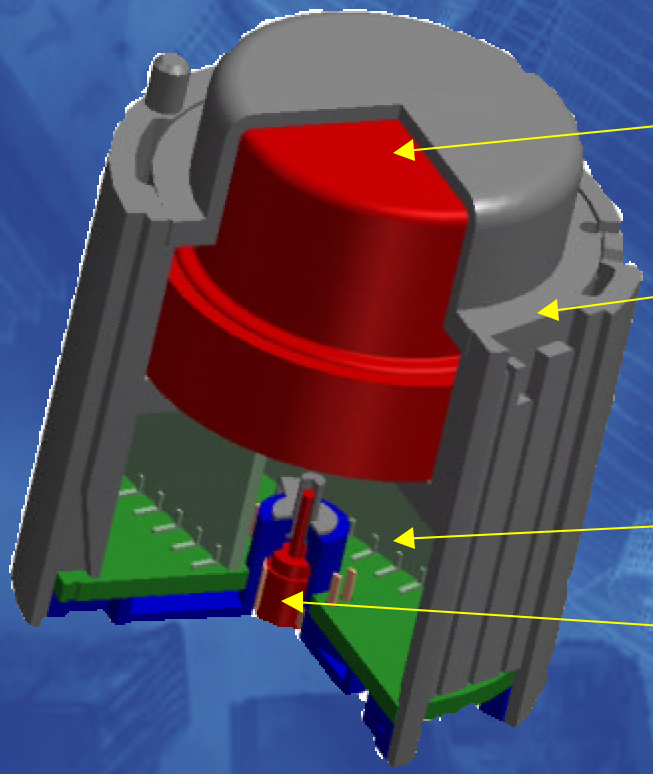
Lower module assembly



Reserve battery

Housing

Electronic circuitry

Detonator

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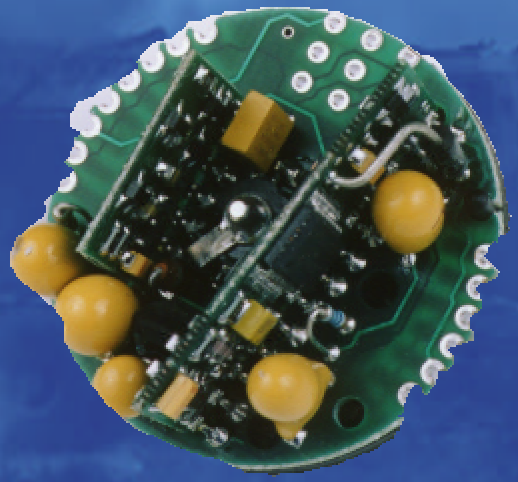
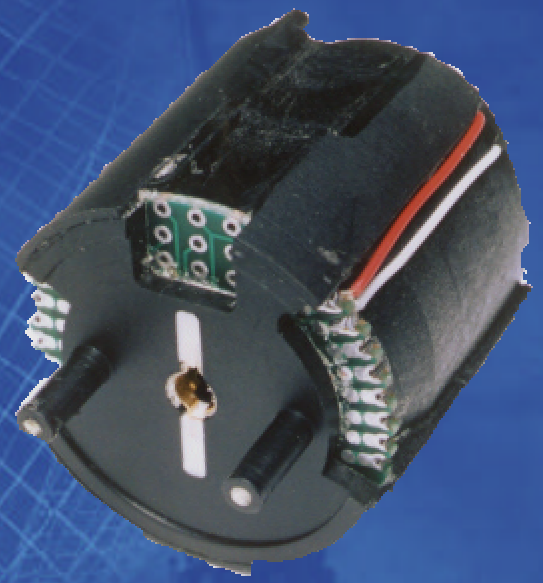
Lower Module Assembly

- FEATURES:
  - Fire circuitry
  - Power supply circuitry
  - Detonator interface
  - Interface to switches or displays
- CUSTOM FEATURES
  - Fire circuit safety times
  - Post impact delay time





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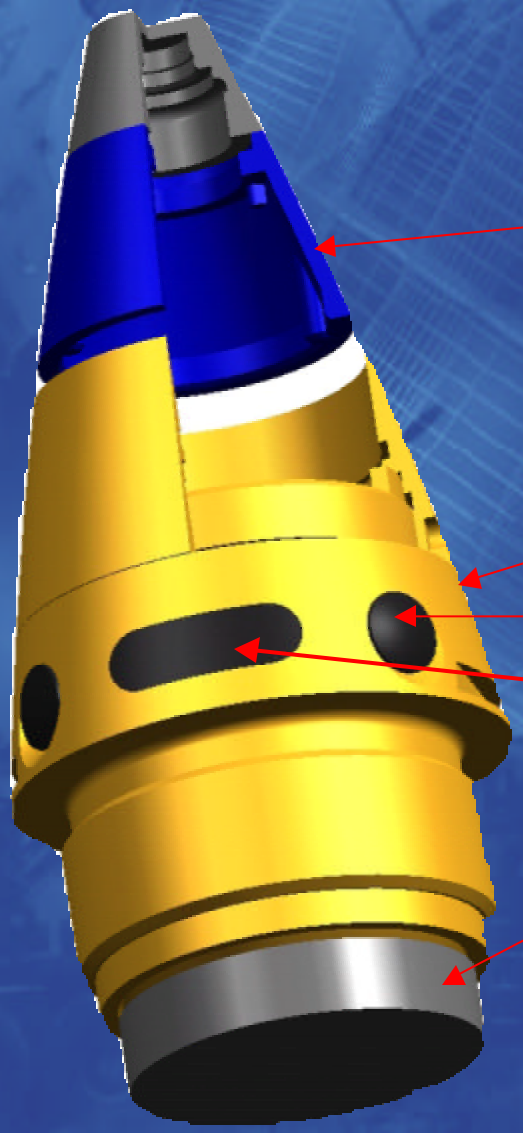
General construction



Nose cone

Fuze body

Push buttons

Display

Safe and arm device

Display

Mode switch

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General Construction

- FEATURES:
  - Houses all sub-assemblies
- CUSTOM FEATURES
  - Switches for MOFA or PROX/PD
  - Buttons for time fuze setting
  - Display for time fuze setting
  - Safe and arm device
    - 40m or 200m Options

SAFE AND ARM DEVICES

DISPLAY

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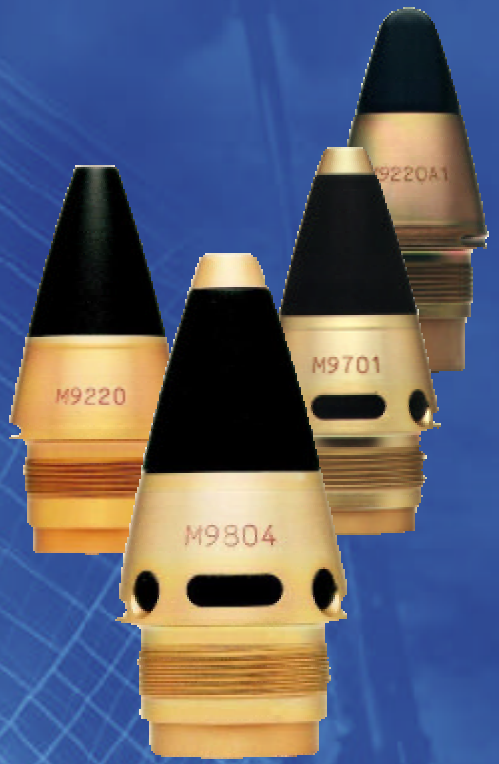
Derived Range of Artillery Fuzes

ARTILLERY PROXIMITY, ELECTRONIC PD / DELAY AND MOFA FUZES

FUZE SETTER



ARTILLERY TIME FUZES

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Future Possibilities

- Further Enhance Flexibility by:

- Mid – Life Software Upgrade to Fuzing Systems
  - Depot Modification of Microprocessor code via Inductive Setting Coil
  - (Currently done by hard wiring at final production stage)

- Examples:
  - Convert Proximity Fuzes to Multi-Role Fuzes
  - Upgrade ECCM features as a software retrofit
  - Improve reliability by use of improved signal processing

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Summary

- Benefits of a modular development approach:
  - Significantly reduced number of Dynamic Firings
  - Reduced Development Time
  - Reduced Technical Risk
  - Increased Manufacturing Flexibility
    - Different Fuzes can be produced with the same material
  - Reduced Life cycle cost
    - Software only Mid-life upgrades
  - Re-work or Re-use of fuzes without physical disassembly

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CONCLUSION

A modular approach to electronic fuze development assists in reducing ‘time to market’ and development costs as well as reducing risks involved in adopting untested hardware

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Dependable Fuze Technology

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